Imagery-Based Nitrogen Fertilization with Sentinel Fertigation N-Time®

Study ID: 1243-035-2024-01
County: Clay
Soil Type: Crete silt loam, Uly-Hobbs silt loam, Hastings silt loam
Planting Date: 4/24/24
Harvest Date: 10/11/24
Seeding Rate: 34,000
Row Spacing (in): 30
Hybrid: Beck's® 6374V2P, Beck's® 6381AM
Reps: 4
Previous Crop: Soybeans
Tillage: No-Till
Herbicides: ***Pre:*** 16 oz/ac Atrazine® 4L + 12 oz/ac Detonate® + 3.5 oz/ac Fission® + 48 oz/ac Lexar® EZ + 21 oz/ac Roundup PowerMAX® 3 + 7.9 oz/ac Visca Flame® on 5/16/24
Seed Treatment: Beck's® Escalate®
Foliar Insecticides: None
Foliar Fungicides: 13.7 oz Trivapro® at VT

Fertilizer: 120 lb N/ac as 32-0-0 with Centuro® on 3/20/24
Irrigation: Pivot, Total: 5.62"
Rainfall (in):

Baseline Soil Samples:

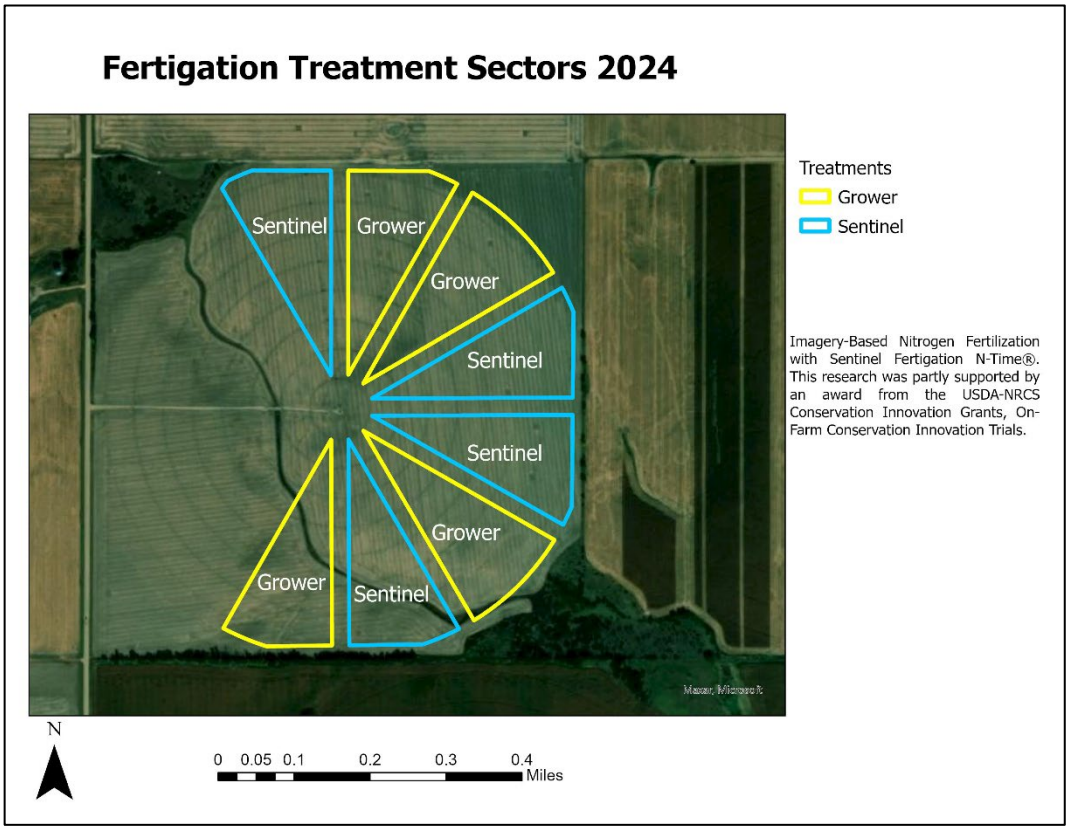
pH	OM LOI %	Nitrate–N ppm N	P ppm	S ppm	K ppm	Ca ppm	Mg ppm	Na ppm	CEC me/100g
6.9	3.2	7.5	51	21.7	419	2327	249	67	15.1
7.2	2.6	6.4	64	14.0	414	3313	499	37	21.9
6.0	3.4	8.0	36	15.9	455	2550	506	29	19.8
5.7	3.1	12.4	78	27.6	429	1901	294	35	17.3

Post Season Soil Samples:

pH	OM LOI %	Nitrate–N ppm N	P ppm	S ppm	K ppm	Ca ppm	Mg ppm	Na ppm	CEC me/100g
7.0	2.5	2.8	52	17.3	343	3711	633	48	24.9
6.4	3.3	4.1	24	15.3	285	2106	207	41	15.0
5.7	3.3	10.3	35	20.5	369	2103	333	39	19.4
5.3	3.1	5.6	38	20.0	308	1664	241	36	17.8
5.8	3.2	3.5	38	16.3	390	1783	240	43	16.8

Introduction: Corn nitrogen management may be improved by using sensors or imagery to detect and respond to corn N needs during the growing season. Sentinel Fertigation's N-Time® application analyzes multispectral images to deliver fertigation scheduling recommendations. Indicator blocks (small blocks established during the base N applications) with higher (+60 lb-N/ac) and lower (-30 lb-N/ac) nitrogen rates were applied in the field on March 20, 2024, to monitor and determine when fertigation was needed.

If an N application was recommended by N-Time®, the N (lb-N/ac) applied via fertigation (typically 30 or 60 lb-N/ac) is noted in the application table below. Note that different Sentinel sectors of the pivot may receive different recommendations throughout the growing season. This study compared the grower's standard N management to the Sentinel Fertigation N-Time® N management, with four paired sectors of each treatment (each sector was about 7.5 acres, buffered 60 feet internally to reduce sprinkler package overlap between sectors); the field trial layout is shown below.



Application Table: Nitrogen applied throughout the 2024 growing season is included in the table below. N applications (in lb-N/ac) are noted by date, along with products applied at those instances. Sentinel N-Time® began monitoring and directing N fertigation applications following the July 11, 2024, N application. N-Time® directed N applications are shaded in gray to the right of the double vertical lines in the table below.

N was applied using 32% UAN unless otherwise noted. Gray-shaded area to the right of the striped line indicates where Sentinel Fertigation N-Time® dictated N rates. The applied values were averaged across all reps; therefore, if only one out of four replications triggered an application of 30 lb N/ac, a value of 7.5 lb N/ac is reported as the average treatment N application across reps.

	3/20	7/11	7/25	Total N Applied
Treatment	----------*lb N/ac applied*----------			
Grower N Management	120 [a]	35.4[b]	35.4[b]	**190.8**
Sentinel Fertigation N-Time®	120 [a]	-	17.7 [b]	**137.7**

[a] Product used was 32-0-0 UAN via Indicator block Rx

[b] Product used was 32-0-0 UAN via fertigation

	Stand Counts	Stalk Rot (%)	Crude Protein Dry Basis	Ruminant Total Digestible Nutrients (TDN) (%)
Grower N Management	32,750 A	6.25 A	8.23 A	88.22 A
Sentinel Fertigation N-Time ®	33,125 A	6.88 A	8.24 A	88.04 A
P-Value	0.547	0.638	0.979	0.616

Results:

	Total N rate (lb/ac)	Moisture (%)	Yield (bu/ac)†	Partial Factor Productivity of N (lb grain/lb N)	lbs N/bu grain	Marginal Net Return‡ ($/ac)
Grower N Management	190.8	14.0 A*	269 A	79 B	0.71 A	1,074 A
Sentinel Fertigation N-Time®	137.7	14.1 A	264 A	107 A	0.52 B	1,080 A
P-Value	N/A	0.612	0.222	0.0005	<0.0001	0.714

*Values with the same letter are not significantly different at a 90% confidence level.
†Yield values are from cleaned yield monitor data. Bushels per acre were corrected to 15.5% moisture.
‡Marginal net return based on $4.35/bu corn and $0.5 lb/N.

Summary:

- There were no significant differences for moisture, yield, or marginal net return between treatments.
- The Sentinel Fertigation N-Time® management system called for a 53.1 lb reduction in N applications during the growing season.
- There were significant differences in partial factor productivity and lbs N/bu of grain. Sentinel Fertigation N-Time® increased Partial Factor Productivity (PFP) by 28% and improved nitrogen use efficiency (NUE) by 26.76% compared to the grower N Management.
- Up to 20% greensnap was found in the field with the east-west rows having the most damage.

This research was partly supported by an award from the USDA-NRCS Conservation Innovation Grants, On-Farm Conservation Innovation Trials, award number NR203A750013G014.